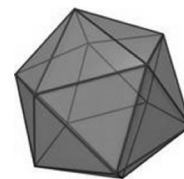


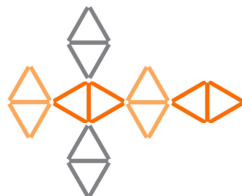
## ICOSAHDREDON PUZZLE



This practical activity involves making a skeletal model of an icosahedron by tying together sticks made from paper rolled tightly around pieces of string.



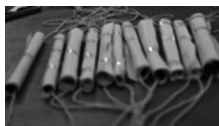
Make 6 rhombuses as shown with 5 sticks for each one.



Tie the rhombuses together to make this pattern noting how the different coloured rhombuses fit into the pattern.

Then make it into an icosahedron. Note that there are exactly 5 edges meeting at all vertices.

What properties of the icosahedron do you notice?



When making your paper sticks it helps to fix the string onto the paper with sticky tape before starting to roll it so the string stays in place. Roll the paper tightly around the string and secure it with sticky tape. Four 10.5 cm sticks can be made from one A4 sheet of paper cut into 4.

## HELP

All angles are equal in a regular polygon and all the edges are equal.

The faces of regular polyhedra are all regular polygons and there are the same number of faces meeting at each vertex.

The faces of the icosahedron are all equilateral triangles.

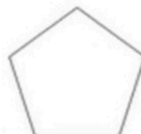
### REGULAR POLYGONS



Triangle – 3 sides



Square – 4 sides



Pentagon – 5 sides



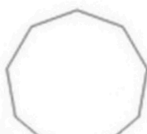
Hexagon – 6 sides



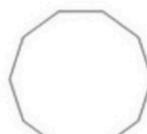
Heptagon – 7 sides



Octagon – 8 sides



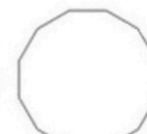
Nonagon – 9 sides



Decagon – 10 sides



Hendecagon – 11



Dodecagon – 12

## NEXT

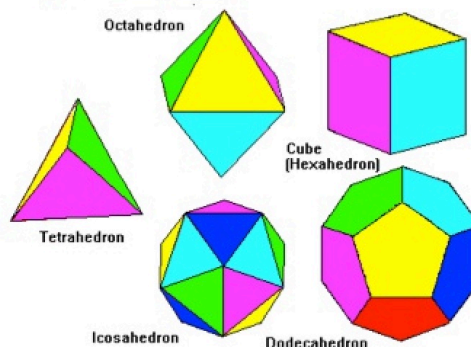
Study as many polyhedra as you can and fill in the following table recording the number of faces, edges and vertices of these polyhedra. What do you notice?

The soccer ball is an inflated buckyball or Buckminster fullerene made with 20 hexagons and 12 pentagons. The buckyball bonding of carbon atoms is found in soot.

The structure is used in building geodesic domes.



### Regular Polyhedra – The Platonic Solids



Name of polyhedron	Number of faces <b>F</b>	Number of edges <b>E</b>	Number of vertices <b>V</b>
Cube			
Tetrahedron			
Octahedron			
Icosahedron			
Dodecahedron			
Buckyball			
Square based pyramid			
Triangular prism			
Cuboid			

Play with the numbers F, V and E for each solid. Add and subtract these numbers. What do you notice? Can you discover a relationship between F, V and E?

See this article on Euler's Formula and Topology about the relationship between F, V and E that you should have discovered, and the importance of this result in mathematics:

<https://nrich.maths.org/1384>